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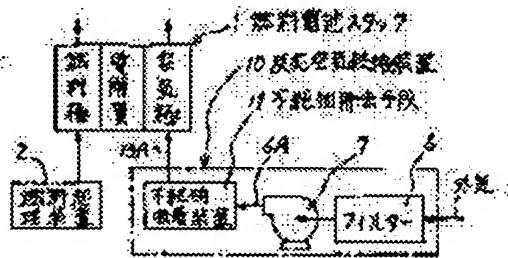
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(54) REACTION AIR SUPPLY UNIT OF FUEL CELL POWER GENERATING SYSTEM

(57)Abstract:

PURPOSE: To remove adverse effect on cell performance by simply, efficiently removing a trace impurity gas constituent such as an organic solvent contained in reaction air.

CONSTITUTION: A reaction air supply unit 10 includes a filter 6, a blower 7, and an impurity adsorbing device 11 as an impurity removing means, and an impurity gas constituent such as an organic solvent contained in pretreatment- finished air 6A from which dust was already removed is adsorbed with an adsorbent in the impurity adsorbing device to purify reaction air 13A. Degradation of an electrolyte and decrease oxygen adsorption capability of an electrode catalyst caused by supplying the reaction air containing the impurity gas constituent to an air electrode of a fuel cell stack 1, and in addition, drop in fuel cell performance resulting from these troubles are prevented.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention -- hydrogen -- in the fuel cell generation-of-electrical-energy system which generates electricity according to the electrochemical reaction of rich fuel gas and the reaction air as an oxidizer, it is related with the reaction air supply equipment which supplies pure reaction air to the oxidizer pole of a fuel cell.

[0002]

[Description of the Prior Art] The fuel cell generation-of-electrical-energy system containing the fuel cell stack 1 which drawing 4 is the system configuration Fig. showing the important section of a fuel cell generation-of-electrical-energy system, and consists of a layered product of a unit cell a fossil fuel and a hydrocarbon system fuel -- hydrogen -- with the fuel processing unit 2 which reforms to rich fuel gas and is supplied to the fuel electrode of a fuel cell 1. It consists of air supply equipment 3 which supplies the reaction air as an oxidizer to the oxidizer pole (air pole) of a fuel cell 1, a power converter 4 which changes the output direct current power of a fuel cell 1 into alternating current power, and is supplied to an external load, a control unit 5 which controls these each part.

[0003] Thus, the rise of the supply voltage to the external load under operation of the constituted fuel cell generation-of-electrical-energy system and descent A control unit 5 is controlled by control signal 4S emitted towards the control signals 2S and 3S and power converter 4 which are emitted towards a fuel processing unit 2 and air supply equipment 3 in response to the fact that change-of-load command 9S, and the control signal 1S grade emitted towards the fuel cell stack 1. The utilization factor of the supply voltage to the amount of supply and the external load of fuel gas and reaction air, the hydrogen in a fuel cell stack, and oxygen etc. is controlled in agreement with each desired value corresponding to change-of-load command 9S, and the alternating current power held at the constant voltage is supplied to an external load.

[0004] Drawing 5 is the block diagram showing the easiest configuration for conventional reaction air supply equipment for an example, and reaction air supply equipment 3 consists of a filter 6 and a blower 7, sets to reaction air 3A pretreated air which removed dust with the filter 6, and supplies it to the oxidizer pole (air pole) of the fuel cell stack 1. In addition, when a fuel cell is a pressurization form, what was constituted so that a fuel cell might be supplied, where the turbo compressor was used instead of the blower, and it formed the preheater and the temperature up of the reaction air temperature is carried out near the operating temperature of a fuel cell is known.

[0005]

[Problem(s) to be Solved by the Invention] With conventional reaction air supply equipment, since easy pretreatment which removes the dust contained in the air (open air) of the fuel cell generation-of-electrical-energy system circumference is generating reaction air 3A, when impurity gas constituents, such as an organic solvent steam, are contained during the open air, reaction air 3A containing impurity gas constituents is supplied to the air pole of the fuel cell stack 1 as it is. In a place, it consists of the fuel electrode and air pole to which the unit cell supported the electrode catalyst bed to one field of a porous

electrode base material in the case of for example, the phosphoric acid mold fuel cell, and a matrix which is pinched among both and holds the phosphoric acid as an electrolyte, and the interface of the electrode catalyst which got wet from the acid which the oxygen in reaction air penetrates an electrode substrate, and does not shine is reached, and the electromotive reaction based on electrochemical reaction is performed. Therefore, the impurity gas contained in reaction air penetrates an electrode substrate with oxygen, and reaches an electrode catalyst bed, and since the oxygen adsorption function of an electrode catalyst is checked while contacting an electrolyte, an electrolyte's deteriorating a chemical reaction by the lifting and this chemical reaction and the function as an electrolyte falling, the problem that these cause the fall of the cel property of a fuel cell or a life property owing to generates it. [0006] The purpose of this invention is by removing simple and efficiently the impurity gas constituents of minute amounts, such as an organic solvent contained in reaction air, to eliminate the bad influence to a cel property.

[0007]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, according to this invention, in what is supplied to the oxidizer pole of a fuel cell by making into reaction air pretreated air which removed dust, it shall come to prepare an impurity removal means to remove impurity gas constituents, such as an organic solvent contained in reaction air.

[0008] An impurity removal means shall contain the adsorbent layer of an organic solvent. An impurity removal means shall contain the combustion catalyst bed of an organic solvent. An impurity removal means shall contain the combustion catalyst bed of an organic solvent, and the adsorbent layer of an organic solvent.

[0009]

[Function] the pure reaction air which do not contain impurity gas supply to a fuel electrode , a fall of the deterioration of an electrolyte based on the chemical reaction of impurity gas and an electrolyte and the oxygen adsorption capacity of an electrode catalyst prevent , and the function that these avoid a fall of the cel property which generate owing to obtain by having constituted so that it may have an impurity removal means remove impurity gas , such as an organic solvent with which reaction air supply equipment be contain in reaction air , in this invention .

[0010] If it uses as an impurity removal means, the adsorbent, for example, the activated carbon layer, of an organic solvent, the operation which adsorbs impurity gas and purifies reaction air will be acquired. Moreover, if the combustion catalyst of an organic solvent, for example, a platinum system alloy catalyst layer, is used as an impurity removal means, the function which is contacted for a catalyst, carries out combustion decomposition, and defangs the impurity gas in reaction air will be obtained.

[0011] Furthermore, if the series connection object of the combustion catalyst bed of an organic solvent and the adsorbent layer of an organic solvent is used as an impurity removal means, after carrying out combustion decomposition of the impurity gas by the combustion catalyst bed, it will become possible to carry out adsorption treatment of the residual impurity gas to an adsorbent layer further, and the cleaning effect stabilized also to the high reaction air of impurity gas concentration will be acquired.

[0012]

[Example] Hereafter, this invention is explained based on an example. Drawing 1 is the block diagram showing the reaction air supply equipment of the fuel cell generation-of-electrical-energy system which becomes the example of this invention, and omits the duplicate explanation by giving the same reference mark to the same component as the conventional technique. Reaction air supply equipment 10 is equipped with the impurity adsorber 11 which filled up the container with adsorbents, such as activated carbon, as an impurity removal means in drawing. Pretreated air 6A which removed the dust sent to an impurity adsorber through a filter 6 and a blower 7 Since an adsorbent adsorbs impurity gas constituents, such as an organic solvent of the minute amount which contacts the adsorbent in the impurity adsorber 11 and is contained in pretreated air 6A It becomes possible to supply reaction air 13A in the pure condition that dust was carried out with the filter 6 and adsorption treatment of the impurity gas, such as an organic solvent, was carried out by the impurity adsorber 11 to the oxidizer pole of the fuel cell stack 1. Therefore, it becomes possible to prevent the fall of the deterioration of an electrolyte based on the

chemical reaction of impurity gas constituents and an electrolyte, and the oxygen adsorption capacity of an electrode catalyst, this can avoid conventionally the fall of the cel property generated owing to, and the advantage which can carry out reinforcement of the fuel cell is acquired.

[0013] Drawing 2 is the block diagram showing the reaction air supply equipment which becomes the example from which this invention differs. It differs from the above-mentioned example in that reaction air supply equipment 20 was equipped with the contact combustion catalyst equipments 21 of inflammable gas, such as an organic solvent, as an impurity removal means. As a contact combustion catalyst for example, by using a platinum system alloy catalyst Since the inflammable impurity gas constituents contained in pretreated reaction air 6A contact a platinum system alloy catalyst and understand a burned part, the advantage which can supply reaction air 23A by which impurity gas constituents, such as an organic solvent, were eliminated to the air pole of the fuel cell stack 1 is acquired.

[0014] Drawing 3 is the block diagram showing the reaction air supply equipment which becomes the example from which this invention differs further. Reaction air supply equipment 30 as an impurity removal means 31 The contact combustion catalyst equipments 21 of inflammable gas, such as an organic solvent, The point constituted as a serial object with the impurity adsorber 11 which filled up the container with adsorbents, such as activated carbon, differs from each above-mentioned example. As a contact combustion catalyst for example, by using a platinum system alloy catalyst Since the inflammable impurity gas constituents contained in pretreated reaction air 6A contact a platinum system alloy catalyst, and carry out combustion decomposition and an adsorbent carries out adsorption treatment of the impurity gas constituents, such as an organic solvent of the minute amount which remained further For example, also when pretreated air 6A which contains a high-concentration organic solvent steam etc. transitionally flows into the impurity removal means 30 Reaction air supply equipment 30 equipped with the impurity removal means by which combustion decomposition and the impurity gas-removal engine performance which carries out adsorption treatment further and can supply reaction air 33A of a pure ambient atmosphere to a fuel cell are high is obtained in these.

[0015] As mentioned above, in order to verify the impurity escape-of-gas engine performance of drawing 1 , drawing 2 , and the impurity removal means 11, 21, and 31 shown in drawing 3 , it is 100 ppm about toluene, an acetone, and a xylene as organic solvent gas constituents, respectively. To the reaction air supply equipments 10, 20, and 30, gas-concentration-measurement equipment was used and the simulation reaction air to include was measured for a sink, the acquired reaction air 13A and 23A, and the organic solvent gas concentration in 33A. both [consequently,] the impurity adsorber 11 which organic solvent gas concentration fell below to the limit of detection of gas-concentration-measurement equipment also in which reaction air supply equipment, and was filled up with adsorbents [, such as the contact combustion catalyst equipment 21 of inflammable gas, and activated carbon,], such as an organic solvent, and both serial object -- although -- it was proved that it had the removal engine performance of high organic solvent gas constituents.

[0016]

[Effect of the Invention] This invention was constituted so that the reaction air supply equipment of a fuel cell might be equipped with either contact combustion catalyst equipment, an impurity adsorber or both serial object as mentioned above as an impurity removal means to remove impurity gas, such as an organic solvent contained in reaction air. Consequently, it becomes possible combustion decomposition or to carry out adsorption treatment and to supply pure reaction air to the air pole of a fuel cell stack about impurity gas constituents, such as an organic solvent of the minute amount contained in the pretreated reaction air which removed dust. Deterioration of the electrolyte conventionally produced in the fuel cell by supplying the reaction air containing impurity gas constituents to the air pole of a fuel cell stack as it is, and the depression of the electrolyte resulting from this, Or the fall of the oxygen adsorption capacity of an electrode catalyst etc. can be prevented, these can eliminate the problem that the cel property of a fuel cell falls owing to, and the fuel cell generation-of-electrical-energy system equipped with the reaction air supply equipment which can carry out reinforcement of the fuel cell can be offered.